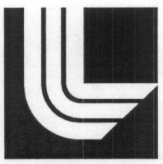

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International Exchange of Emergency Phase Information and Assessment: An Aid to Inter/National Decision Makers

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Summary

This paper discusses a collaborative project whose purpose is 1) to demonstrate the technical feasibility and mutual benefit of a system seeking early review or preview, in a "quasi peer review" mode, of nuclear accident plume and dose assessment predictions by four major international nuclear accident emergency response systems before release of their calculations to their respective national authorities followed by 2) sharing these results with responsible inter/national authorities. The extreme sensitivity of the general public to any nuclear accident information has been a strong motivation to seek peer review prior to public release. Another intended objective of this work is 3) the development of an affordable/accessible system for distribution of prediction results to countries having no prediction capabilities and 4) utilization of the link for exercises and collaboration studies. The project exploits the Internet as a ubiquitous communications medium, browser technology as a simple, user friendly interface, and low-cost PC level hardware.

The participants are developing a web based dedicated node with ID and password access control, where the four systems can deposit a minimal set of XML-based data and graphics files, which are then displayed in a common identical map format. Side-by-side viewing and televideo conferencing will permit rapid evaluation, correction or elaboration of data, recalculation (if necessary) and should produce a strong level of consensus to assist inter/national decision makers. Successful completion of this work could lead to easy utilization by national and international organizations, such as the IAEA and WHO, as well as by non-nuclear states at risk of a trans-boundary incursion on their territory.

Introduction

Nuclear accidents/incidents cause significant fear in citizens perceived to be (potentially) impacted. Such events challenge national governments and international agencies to quickly and confidently provide assurance of safety and protection advice for those at risk. Based on the experience of several radiological accidents, e.g., Three Mile Island, Chernobyl, Algeciras, etc., it is evident that large areas, frequently trans-boundary, and large numbers of citizens have the potential to be impacted. Additionally, as a consequence of current "globalization", i.e. governmental, business, education and leisure travel, most nations now daily host numerous international visitors whose national government embassies have an immediate responsibility to advise and protect them from hazards. This mixture of large area, trans-boundary risk and international mobility presents a significant challenge to the inter/national decision maker community in order to deliver the best consistent advice to all those potentially subject to impact by a nuclear accident. Similarly, it is important to assure those who are not impacted by an accident.

Post-Chernobyl there has been definitive progress and agreement in the determination of dose protection thresholds. In the same time period there has been a proliferation of dispersion models and assessment systems, from the local to the international scale, to support decision makers at all levels of government. Unfortunately, due to the varying parameters of scale, resolution, input data, physics assumptions, and graphics display formats, the consequent assessment results can vary substantially enough [Atmes, ETEX] to (potentially) cause confusion and even apparent contradiction when presented to decision makers. A further difficulty faced by emergency response managers is the diverse and confusing array of data formats, e.g. JPEG, PNG, PPT, etc. and receipt paths, e.g. e-mail, e-mail attachments, URLs and even Fax. Figures 1 and 2 reveal the present situation as evidenced by information prepared in the recent DSSNet exercise of May 26, 2003. Such a circumstance potentially leads to wrong decisions, undercuts confidence and can negate all the work and benefits of good assessment calculations as tools for emergency managers. Poor or wrong decisions by these emergency managers can lead to severe loss of confidence by the public and possible chaos, unmanageable evacuations, food hoarding, excessive economic losses by agriculture and/or industry, ineffective or inefficient application of limited response resources, and most importantly unnecessary, avoidable radiation doses to the impacted population. Figure 3 graphically depicts the relative importance and difficulty of these early decisions; it reminds us where and how we should focus our delivery of decision support information.

Background

From 1996 to 1999 Japan (JAERI) and the USA (LLNL) investigated, developed and tested an initial capability to share basic event information, e.g. start time, source/rates, local meteorology, local measurements, and calculated assessment plots, via Internet websites and to interactively dialogue via web-based two-way televideo conferencing technology (Sullivan, et al., 2001). While,

in principle, the results were functional, the linkups proved to be rudimentary and somewhat unstable for combined video, voice and whiteboard interaction. JAERI (WSPEEDI) and LLNL (NARAC) did successfully exploit this project during two separate radiological accidents in Tokai, Japan (1997, 1999) and during the Algeciras event (1998). After evaluating and using web sites and an SGI-based "In Person" software package, two factors compelled a re-evaluation of the video-teleconference tool. These factors were: 1) Internet congestion during a real accident causing serious degradation of the connection and 2) the desire to expand the project to include the collaboration with other countries where PC-based systems were more readily accessible than workstations like SUN and SGI. Also, an Apple MAC-based televideo tool "Clear Phone" by a small US company has since disappeared.

In 1999 the EU/RODOS project expressed an interest to join in this effort. Though delayed first by untimely reorganizations and then the aftermath of the September 11, 2001 terrorist attacks the USA renewed interest in this project in late 2002; subsequently Russia/FEERC joined.

Renewed project

The motivation for this renewed project is to demonstrate the utility and advantages of a single web site for operational emergency response organizations by providing 1) the results of a quick look, peer reviewed, multi-lateral coordination of assessment products and 2) give inter/national organizations a common site for reference, consensus and some level of confidence. Since 1999 there has been substantial improvement in Internet bandwidth, efficient and versatile data exchange protocols (e.g., the extensible markup language XML) and televideo conferencing technology. The LLNL/NARAC project has volunteered to create the international web node for this project and will leverage software it has developed for emergency event data management and presentation. The NARAC Web application provides the software interface tool to obtain and share NARAC predictions using a standard web browser, and facilitates the easy sharing and distribution of plume and dose predictions with multiple (government) agencies for emergency planning and management.

We will implement the XML data exchange protocol in conjunction with the EU MODEM project at these four major centers/systems for file transfer to this single, dedicated web node (UserID and password protected) where the input parameters received will be displayed in a standard format and calculations processed for display onto common reference maps. We envision a very limited set of products for the emergency phase reviews, e.g. accident notification information (location, time, estimated source rates or event class, site meteorology), 24 and 48 hour I-131 inhalation, Cs-137 deposition and perhaps Total Integrated Dose calculations. A multi-party televideo conferencing capability (Microsoft's NetMeeting) provides the opportunity to "meet and discuss" for the exchange of key information in near real-time, with examination and comparison of calculated assessments in a quasi peer review mode. This dedicated web node provides a secure forum in which to detect missed input data as well as deficiencies in meteorology, resolution, topography, etc., thus leading to refinement, consensus and "harmonization" in real time prior to the release of assessments to decision makers. Once the review is completed and consensus formed, the node can be opened to "bona fide" organizations. We envision periodic updating, e.g., 12 hourly, during the emergency phase of an event. If this project proves to have developed a beneficial tool, we could possibly include the ENSEMBLE and ECURIE project graphic products for accidents in Europe. Such a system should be a benefit to all the inter/national agencies involved in advising and protecting impacted citizens by reducing some of the information challenges they (the decision makers) face and, hopefully, resulting in consistent, timely and presumably the best information for dose avoidance.

In the near future we expect that with successful demonstration and experience, this system could provide a tool for operational emergency decision makers in non-nuclear countries and international agencies such as the IAEA and WHO. It could also serve as a common standard information source for post-accident assessments.

References:

Sullivan, T.J., R.D. Belles, J.S. Ellis, M. Chino, H. Nagai, 2001: A Report of the Joint Development of a Prototype Communications Link to Share Nuclear Accident Dispersion and Dose Assessment Modeling Products Between JAERI/WSPEEDI and LLNL/NARAC. LLNL Report UCRL-ID-143976.

Acknowledgements
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Figures:

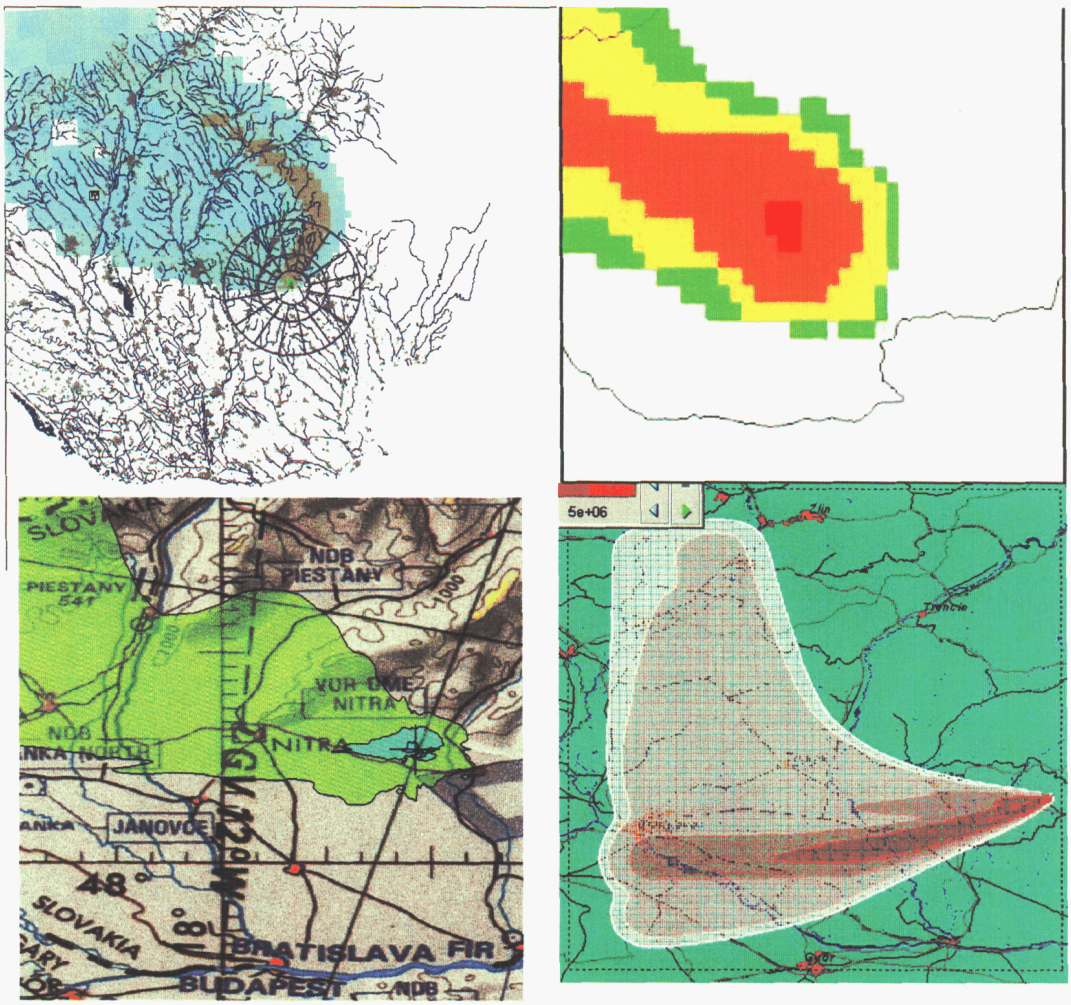

Figure 1. Results for the 24 hour Cs-137 deposition calculations (near range) for the May 26, 2003 DSSNet Exercise as provided by the four systems, namely FEERC, JAERI, NARAC and RODOS.

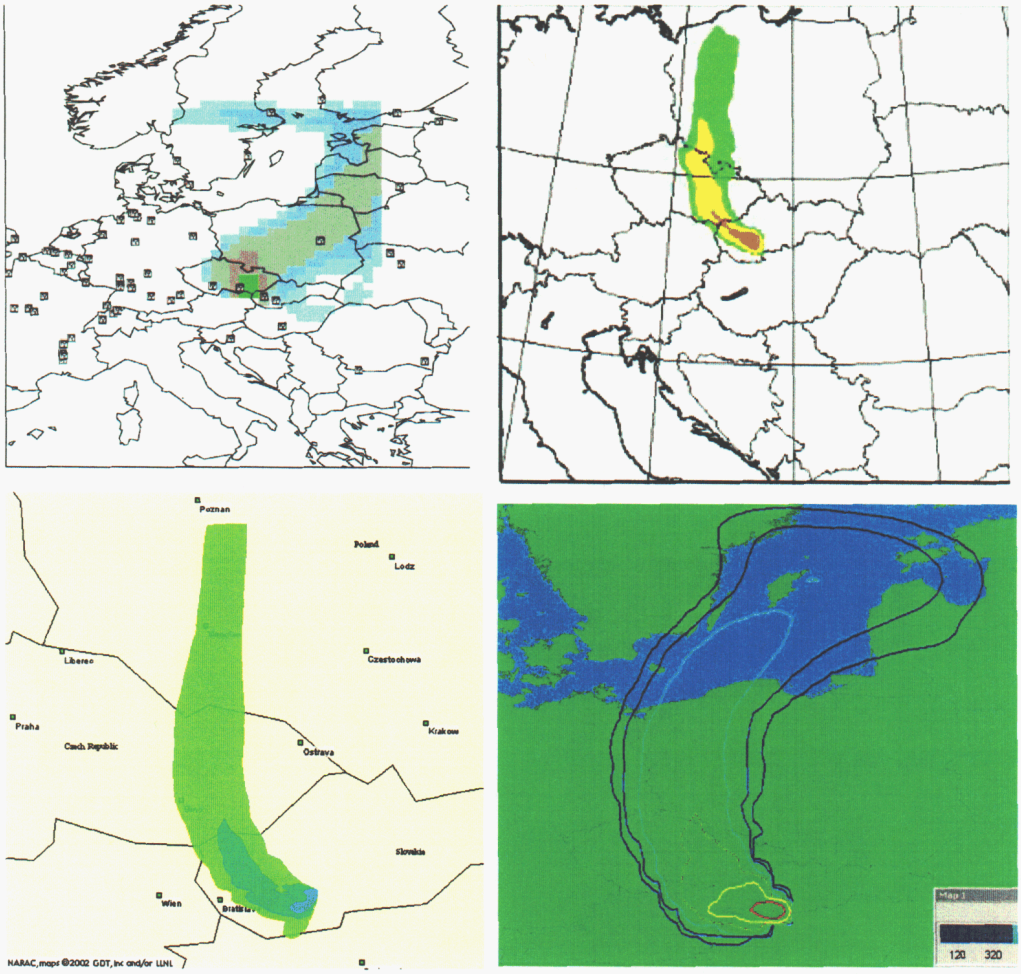

Figure 2. Results for the 48-72 hour Cs-137 deposition calculations (long range) for the May 26,2003 DSSNet Exercise as provided by the four systems, namely FEERC, JAERI, NARAC and RODOS.

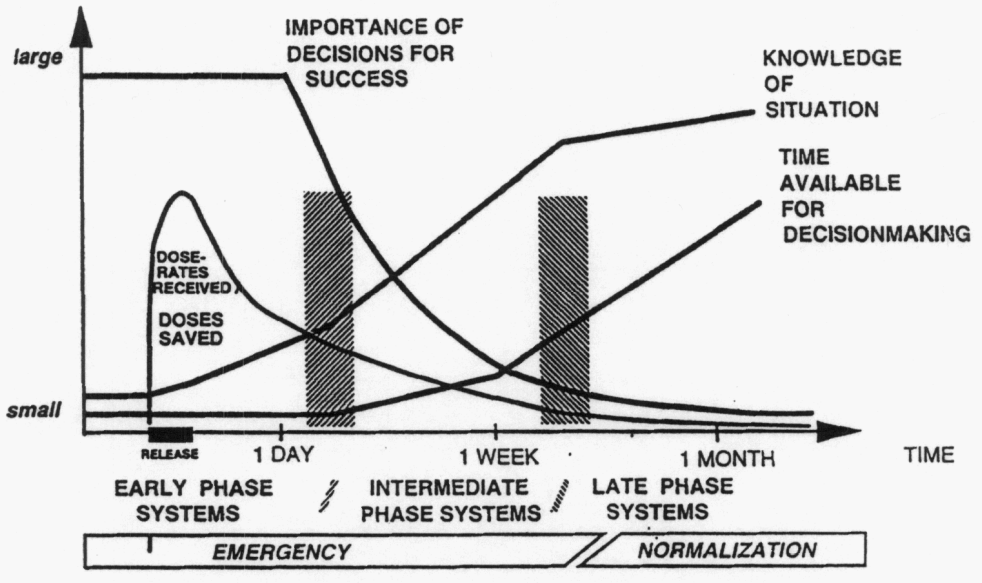

Figure 3. From a paper by Hans Brunner on the importance of situational knowledge and the limited availability of time for good decision making (in the Proceedings of the OECD/NEA Nuclear Emergency Data Management International Workshop, Zurich, Switzerland, 13-14 September, 1995.

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